



PATENT
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For: FOAMED LAMINATE BASED ON OLEFIN AND USE
THEROF

DECLARATION UNDER 37 CFR 1.132

Commissioner for Patents
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Sir:

I, Kyoko KOBAYASHI, declare the following.

I am fully knowledgeable of the disclosure of the above-identified application and the field of art of the present invention. I have read and understand the Office Action dated June 30, 2005 and the references cited therein to EP 974 617 (EP'617), EP 976 782 (EP '782) and US 6,306,666 (US '666). US '666 is in the same patent family as EP '782.

It is my opinion that the exemplified embodiments described in the present specification are evidence that the inventive foamed laminate has unexpectedly superior properties to the laminate of the cited primary reference, EP '617. The exemplified embodiments described in the present specification are reproduced below.

The following experiments were either performed by me or under my direct supervision.

Components used in the experiments:

(j-11): A polyolefin resin

A propylene/ethylene block copolymer which has an MFR (ASTM D-1238-65T, 230 °C, 2.16 kg load) of 50 g/10 min., a density of 0.910 cm³ and an ethylene content of 8 mole %.

(j-21): An ethylene/ α -olefin copolymer rubber

An ethylene/propylene/5-ethylidene-2-norbornene copolymer rubber which has an ethylene content of 63 mole %, an iodine value of 13 and a Mooney viscosity [ML₁₊₄(100 °C)] of 100.

(B-2): A foaming agent

This is azodicarbonamide.

(c-11): A rubber

An ethylene/propylene/5-ethylidene-2-norbornene

copolymer rubber which has an ethylene content of 70 mole %, an iodine value of 12 and a Mooney viscosity $[ML_{1+4}(100\text{ }^{\circ}\text{C})]$ of 120.

(c-21): A polyolefin resin

A propylene/ethylene block-copolymer which has an MFR (ASTM D-1238-65T, 230 $^{\circ}\text{C}$, 2.16 kg load) of 13 g/10 min., a density of 0.91 g/cm³ and an ethylene content of 3 mole %.

(D-1): An organopolysiloxane

This is a silicone oil {a product of Toray-Dow Corning K.K. with trademark SH200 (3000 cSt)}.

(G-2): A polyolefin resin

A propylene/ethylene block-copolymer which has an MFR (ASTM D-1238-65T, 230 $^{\circ}\text{C}$, 2.16 kg load) of 13 g/10 min., a density of 0.91 g/cm³ and an ethylene content of 3 mole %.

(K-1): An olefinic thermoplastic resin

This is a homopolymer of propylene having an MFR (ASTM D-1238-65T, 230 $^{\circ}\text{C}$, 2.16 kg load) of 0.3 g/10 min. and a density of 0.910 g/cm³.

(C-2): olefinic thermoplastic elastomer

On a Bumbury's mixer, 60 parts by weight of the rubber (c-11) and 40 parts by weight of the crystalline polyolefin resin

(c-21) (having a degree of crystallinity = 72 % determined by X-ray diffraction) were kneaded at 180 °C under a nitrogen atmosphere for 5 minutes, followed by passing through a sheeting roll to produce dice-formed pellets by a sheet cutter. Then, the dice-formed pellets were mixed with 0.2 part by weight of 1,3-bis(tert-butylperoxyisopropyl)benzene and 0.2 part by weight of divinylbenzene on a Henschell mixer. Thereafter, the resulting pelletized product was extruded at 210 °C by a double shaft extruder having an L/D value of 40 and a screw diameter of 50 mm under a nitrogen atmosphere, whereby an olefinic thermoplastic elastomer (C-2) was obtained.

The resulting olefinic thermoplastic elastomer (C-2) had a gel content of 78% by weight.

Example 2-1: foam for core

(J-1): olefinic thermoplastic elastomer

On a Bumbury's mixer, 30 parts by weight of the polyolefin resin (j-11) and 70 parts by weight of the ethylene/ α -olefin copolymer rubber (j-21) were kneaded at 180 °C under a nitrogen atmosphere for 5 minutes, followed by passing through a sheeting roll to produce a pelletized product by a sheet cutter. Then, 100 parts by weight of this pelletized product and a solution of 0.3 part by weight of 1,3-bis(tert-butylperoxyisopropyl)benzene dissolved in 0.3 part by weight of divinylbenzene were mixed on a

tumbler type blender, in order to coat the pellets with the solution uniformly. Thereafter, the resulting palletized product was extruded by an extruder at 210 °C under a nitrogen atmosphere to effect the dynamic heat treatment, whereby an olefinic thermoplastic elastomer (J-1) having a gel content of 77 % by weight was obtained.

100 parts by weight of the so-obtained olefinic thermoplastic elastomer (J-1) and 5 parts by weight of the olefinic thermoplastic resin (K-1) were extruded by an extruder at 210 °C under a nitrogen atmosphere to produce a pelletized product of an olefinic thermoplastic elastomer composition. From this pelletized product, a cylindrical test specimen having a thickness of 12.7 mm and a diameter of 29.0 mm was produced by injection molding, for which compression set (JIS K 6262, 70 °C, 22 hours) was observed, which was determined to be 36 %. Also a melt flow rate was observed for this pelletized product which was determined to be 33 g/10 min.

There were blended 100 parts by weight of the ethylenic thermoplastic elastomer (J-1), 5 parts by weight of the olefinic thermoplastic resin (K-1) and 1.5 parts by weight of the foaming agent (B-2) on a tumbler type blender to prepare a foamable composition of Example 2-1.

Example 2-11

(Z2-7): olefinic thermoplastic elastomer composition for the skin layer:

On a double shaft extruder, 100 parts by weight of the olefinic thermoplastic elastomer (C-2) obtained in Example 2-5, 2 parts by weight of the organopoly-siloxane (D-1) and 30 parts by weight of the polyolefin resin (G-2) were kneaded, whereby an olefinic thermoplastic elastomer composition (Z2-7) for the skin layer was obtained.

This olefinic thermoplastic elastomer composition (Z2-7) was molded under co-extrusion together with the olefinic foamable composition same as that of Example 2-1 to produce a weather strip, for which the durability test was carried out. The weather strip had withstood the 50,000 repetition test and had maintained its function as weather strip.

Inventive Example 3-1

A test specimen was prepared by cutting the contact seal lug 3 out of the weather strip of Example 2-11 (See Fig. 1 below).

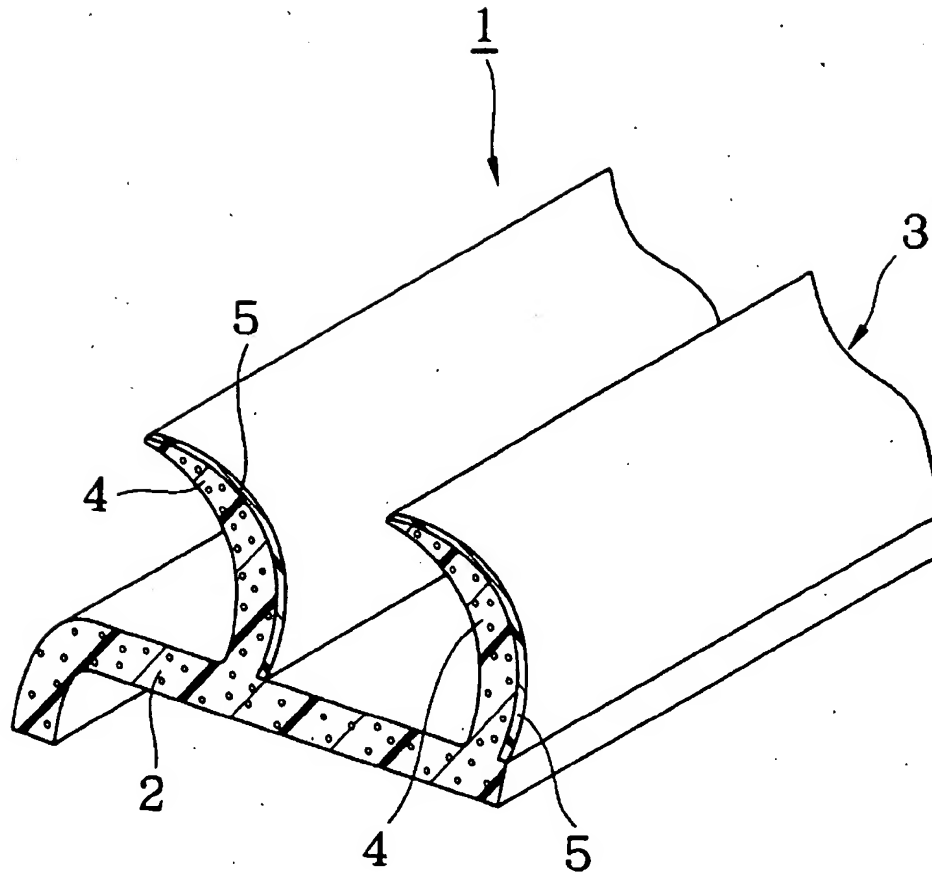
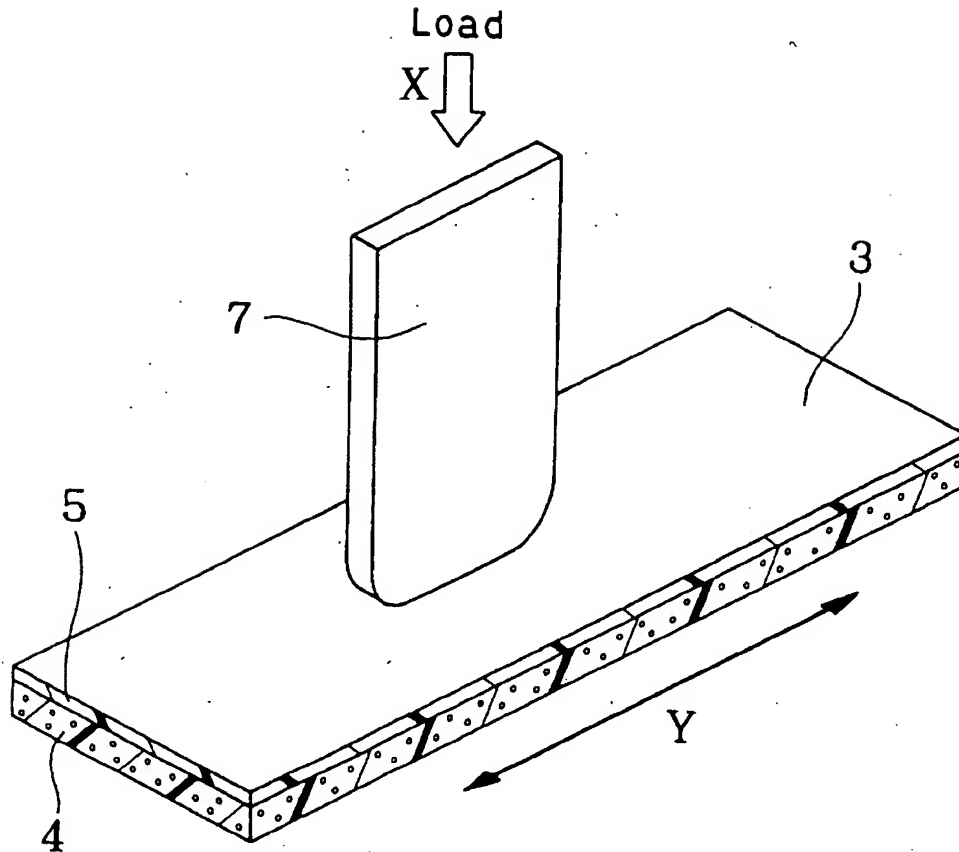


FIGURE 1

Onto the skin layer 5, a glass friction piece 7 (20 mm width, 30 mm height, 4.5 mm thickness) was caused to contact as shown in Fig. 2 below.

**FIGURE 2**

On the sliding abrasion tester, a muddy slurry friction test was carried out in such a manner that the contact seal lug 3 was moved to go and return along the direction of the arrow Y over a stroke of 100 mm while imposing on the glass friction piece a load of 3 kg towards the direction indicated by the arrow X. Here, a muddy slurry (water/sand = 3/1) was dripped onto the contact region at the initial stage and at an interval of 1,000 repeats of the reciprocating movement using a 0.5 ml syringe.

The state of wearing was assessed after 5,000 repeats of the reciprocal movement. The results are recited in Table 2 below.

Comparative Example 3-1

The muddy slurry friction test same as that of Example 3-1 was carried out except that a test specimen made of a non-foamed laminate prepared by laminating a layer of the olefinic thermoplastic elastomer (J-1) for the substrate layer of Example 2-1 on the layer of the olefinic thermoplastic elastomer composition (Z2-7) for the skin layer as was used in Example 3-1.

Table 2

	Assessment rank *)
Example 3-1 (foamed core)	5
Comp. Example 3-1 (solid core)	3

Note *): Assessment rank 5: almost no wear found
Assessment rank 3: partial wear found

The difference between Inventive Example 3-1 and Comparative Example 3-1 is that the laminate is formed with a non-foamed core in the comparative example, whereas in the inventive example it is prepared with a foamed core. Based on the muddy slurry friction test results, the Inventive Example 3-1 was assessed to have a rank of 5, which shows that almost no wear was found,

whereas the Comparative Example 3-1 was found to have an assessment rank of 3, which showed partial wear.

Inventive Example 3-2

The flexibility of the foamed laminate according to the present invention was examined. Thus, the weather strip of Example 2-11 was used as the test specimen and hand touch upon impressing onto this specimen was examined as to whether a spongy touch was obtained or not.

Comparative Example 3-4

The test was carried out in the same manner as in Example 3-2, except that a test specimen made of a non-foamed laminate prepared by laminating a layer of the olefinic thermoplastic elastomer (J-1) for the substrate layer of Example 2-1 on the layer of the olefinic thermoplastic elastomer composition (Z2-7) for the skin layer as was used in Example 3-2. The results are recited in Table 3.

Also, the flexibility of the foamed laminate was assessed and the results are shown in Table 3.

Table 3

	Assessment rank *)
Example 3-2 (foamed core)	5
Comp. Example 3-4 (solid core)	2

Note *): Assessment rank 5: spongy hand touch
Assessment rank 2: some solid touch

The data from the above Table shows that the Comparative Example 3-4 laminate formed using a non-foamed core was assessed to have some solid touch, whereas the Inventive Example 3-2 laminate formed with a foamed core was assessed to have a spongy hand touch.

It is my opinion from the above experimental evidence shows that the inventive laminate containing a foamed core has unexpectedly superior properties to the laminate having a **non-**foamed thermo-plastic elastomer core as described in EP '617. Since there is no teaching or suggestion in EP '617 or EP '782 that having a foamed core would improve the properties of the laminate, these superior results would not be obvious over the combination of EP '617 and EP '782.

Furthermore, I was an inventor on EP '617. EP '617 simply describes the composition of the core as being made from a "thermoplastic elastomer" (see paragraph 0079). It is my opinion that the olefinic thermoplastic elastomer (T-1) used as the solid core for Comparative Example 3-1 and Comparative Example 3-4 is a

typical thermoplastic elastomer used for the core described on paragraph 0079 of EP '617. Accordingly, the above-mentioned tests which include the olefinic thermoplastic elastomer (J-1) as the solid core for Comparative Example 3-1 and Comparative Example 3-4 are appropriate to show that a laminate comprising a solid core made of a thermoplastic elastomer as described in EP '617 is inferior to the inventive laminate comprising a foamed core.

Lastly, it is my opinion that no one can easily combine the teachings of EP '782 with those of EP '617 to attain the foamed laminate defined by the claims, since EP '617 is devoid of any mention as to the skin layer and EP '782 is silent as to the foamed body for the substrate layer.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may

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jeopardize the validity of the application or any patent issued thereon.

Signature

Oct. 19, 2005
Date

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